

## Informal Education

<b>Children</b> .....	29
<b>General Audiences</b> ( <i>K–12, Adult</i> ) .....	30
<b>Earth Science Data &amp; Imagery</b> .....	31
<b>Background Resources for Informal Educators</b>	
Brochures/Guides .....	32
Media/Writer's Guides .....	33
Web Sites .....	33

## Children

### The Adventures of Amelia the Pigeon

<http://imagers.gsfc.nasa.gov/amelia>

This animated adventure engages children in a story-based scenario that emphasizes concepts of remote sensing and how NASA scientists use satellite imagery to better understand the Earth's environmental changes. The adventure introduces students to Earth science concepts, beginning with classifying objects in satellite images by shape, color and texture, building a foundation for interpretation and understanding of remote sensing. The story is set in New York City, chosen for its size, diversity and the visibility of prominent features in satellite imagery. **Recommended for: informal education, children ages 5–9.**

### The Adventures of Echo the Bat

<http://imagers.gsfc.nasa.gov/k-4/index.html>

<http://catalog.core.nasa.gov/core.nsf/item/300.1-06P>

This picture book of Echo the Bat is accompanied by a set of activities that reinforce four basic themes or concepts fundamental to the interpretation of satellite imagery: perspective, shape and pattern, color and texture. Activities and activity sheets are also provided on a companion Web site: <http://imagers.gsfc.nasa.gov/k-4>. **Recommended for: children ages 5–10.**

### The Air We Breathe

Available spring 2004 from NASA CORE:

<http://core.nasa.gov>

Children entering the classroom have different levels of experiences. The picture book *The Air We Breathe* is designed to provide a common level of knowledge about

Earth's atmosphere among students, and a foundation from which the teacher may launch a study of the atmosphere's composition and its importance to life.

**Recommended for: K–4.**

### Alaska: A Bird's Eye View

<http://www.uaf.edu/asgp/k12>

In this Web-based, interactive story, Tutangiaq (Too-tang-geye-ack: nicknamed 2T), a Canada goose, flies across Alaska looking for his family. As he flies, he tells children about the fascinating 49th state. Children learn how Alaska was purchased from the Russians, and other facts about the state. They can also compare the size of Alaska to other states. 2T takes a flight across the volcanic chain in Alaska and helps students to interactively explore how scientists monitor volcanoes from satellite images in near-real time. At the coast, the bird also meets his walrus friend who shows him how the sea ice edge has receded and adversely affected marine life. Finally, 2T arrives in Fairbanks where children use satellite imagery to help 2T find and unite with his family. **Recommended for: grades 5–8.**

### Our Dynamic Planet

<http://www.amnh.org/education/resources/rfl/web/earthmag>

The activities in *Our Dynamic Planet*, an online magazine for kids aged 7–11, encourage children to look more closely at geology in their local environments and support their exploration of a range of dynamic Earth processes, including the sequence of events during an explosive volcanic eruption, how life exists at deep-sea hydrothermal vents, the types of earthquakes associated with the three different types of plate boundaries and the climate impacts of El Niño. The magazine was developed by American Museum of Natural History. **Recommended for: children ages 7–11.**

### Space Place

<http://spaceplace.jpl.nasa.gov>

Fun activities for children to do and make, while they learn about space and Earth science and the technology that enables science. The "Teachers Corner" on the Web site contains curriculum supplements originally published in the ITEAS' *Technology Teacher* magazine.

**Recommended for: elementary–middle school.**

## General Audiences

### Atlas of the Ocean: The Deep Frontier, 2001

<http://shop.nationalgeographic.com>

Featuring more than 150 photographs, maps and NASA satellite images, this atlas charts and celebrates every aspect of the ocean world, from tiny plankton to massive storm systems that rage across thousands of miles. Experts have contributed essays and sidebars on subjects as diverse as deep-sea archeology, plate tectonics, coral reefs, mapping techniques and El Niño. Readers also go behind the scenes to observe modern science at work, as researchers pursue promising leads in dozens of different but intertwined fields. Order online at the URL provided or from National Geographic Society, 1145 17th Street NW, Washington, DC 20036-4688. The *Atlas of the Ocean: The Deep Frontier Teacher's Guide* is a 30-page classroom activity guide that features content taken from the atlas. Subjects include undersea hot spots, underwater archaeology, bioluminescence, coral reefs, and polar sea exploration. Order the *Teachers' Guide* from NASA CORE (\$6, plus shipping). **The atlas is recommended for: formal and informal education audiences, grade 8–adult; the teachers' guide is recommended for middle–high school geography education.**

### Destination Earth

<http://www.earth.nasa.gov>

Destination Earth is the official Web site for ESE. It includes current ESE news and events, sections on education for teachers and students, and information on current research opportunities. Many links to other information resources are also included.

### Earth: Inside and Out

<http://www.thenewpress.com>

*Earth: Inside and Out*, edited by American Museum of Natural History (AMNH) Earth scientist Dr. Edmond A. Mathez, is a book of 19 essays written by leading Earth scientists that provides insight into the dynamic processes that shape the Earth. The essays are supported by case studies describing a range of current research projects (including Looking for Life in Antarctica and Mars, Mapping Mt. Rainer, and Mapping Hot Springs on the Deep Ocean Floor) and profiles of historically significant Earth scientists (Including Inge Lehmann, Milutin Milankovitch and Harold C. Urey). The essays, case studies, and profiles are organized along the same themes explored in the AMNH Gottesman Hall of

Planet Earth, (How do we read the rocks?; How has the Earth evolved?; Why are there ocean basins, mountains and continents?; What causes climate and climate change?; Why is the Earth habitable?)—a large, permanent exhibition that opened at the Museum in 1999.

**Recommended for: high school+.**

### Earth Observatory

<http://earthobservatory.nasa.gov>

NASA's *Earth Observatory* is an interactive Web-based magazine where the science-attentive public can obtain new satellite imagery and scientific information about our home planet. Visit the *Earth Observatory* to read feature articles on wide-ranging Earth system science topics, download datasets and images for analysis, read breaking news, learn about current and planned Earth missions, search an online library for reference materials, track natural hazards around the world in near-real time, and access interactive experiments and classroom activities. **Recommended for: general public, media, informal educators, and middle school–post secondary instruction.**

### Earth Science Picture of the Day (EPOD)

<http://epod.usra.edu>

The EPOD Web site is a collaboration between NASA's Goddard Space Flight Center and the Universities Space Research Association. A new photograph or image highlighting an interesting or unusual aspect of the Earth's system appears every day. Each picture is accompanied by a detailed description and related links. Search the archive by keyword or browse by field or topic. **Recommended for: middle school+, informal education.**

### Earth Update

<http://earth.rice.edu/connected/earthupdate.html>  
<http://core.nasa.gov>

Rice Space Institute developed this CD-ROM, which contains Earth science information, movies and classroom activities. The CD is suitable as a stand-alone museum kiosk or for use in a school classroom or library. If the user's computer is connected to the Internet, today's data can be downloaded with a single click. Each "sphere" (atmosphere, biosphere, cryosphere, geosphere and hydrosphere) can be run separately or as the linked Earth Update. Each sphere includes sections What (What is the atmosphere), Who (Who studies the biosphere), Why (Why do we study the cryosphere?), and How (How do we study the geosphere?). Classroom activities aligned with national science, math and geography standards are included on the CD. Also available from NASA CORE.

**Recommended for: K–12 and informal education.**

**Where on Earth...?" MISR Mystery Image Quizzes**

<http://www-misr.jpl.nasa.gov/education/whereonearth.html>

Embark on a geographical adventure with NASA's Multi-angle Imaging SpectroRadiometer (MISR) Mystery Image Quizzes. These puzzles are designed to inspire understanding of the physical, biological and human processes that influence our home planet and cover topics from Archaeology to Zoology. Several resources for discovering and revealing the meaning of image features may help new geographical detectives to solve the challenging quiz questions. A new "Where on Earth...?" mystery quiz appears as the MISR "latest featured image" approximately once every two months.

Answers are published on the MISR web site (<http://www-misr.jpl.nasa.gov>). The names and home towns of respondents who answer all questions correctly by the deadline will also be published in the order responses were received. The first three people on this list who are not affiliated with NASA, JPL or MISR and who have not previously won a prize will be sent a print of the image.

**Recommended for: informal education.**

**Windows to the Universe**

<http://www.windows.ucar.edu>

*Windows to the Universe* brings together scientific content on Earth and space sciences with interdisciplinary content on the arts and humanities. Three levels of content are provided: students (K–12 through undergraduate), teachers, and browsing adults. The site includes a rich array of documents, images, movies, animations, sounds, games and data that brings science to life for students, teachers, and the interested user.

**Recommended for: K–12, informal education.**

## Earth Science Data & Imagery

See also the section on Web sites (p. 33) for a list of individual Earth science missions.

**Earth Observatory**

<http://earthobservatory.nasa.gov>

NASA's *Earth Observatory* is an interactive Web-based magazine where the science-attentive public can obtain new satellite imagery and scientific information about our home planet. Visit the *Earth Observatory* to read feature articles on wide-ranging Earth system science topics, download datasets and images for analysis, read breaking news, learn about current and planned Earth missions, search an online

library for reference materials, track natural hazards around the world in near-real time, and access interactive experiments and classroom activities. **Recommended for: general public, media, informal educators, and middle school–post secondary instruction.**

**Earth Science Picture of the Day (EPOD)**

<http://epod.usra.edu>

The EPOD Web site is a collaboration between NASA's Goddard Space Flight Center and the Universities Space Research Association. A new photograph or image highlighting an interesting or unusual aspect of the Earth's system appears every day. Each picture is accompanied by a detailed description and related links. Search the archive by keyword or browse by field or topic. **Recommended for: middle school+, informal education.**

**Gateway to Astronaut Photography of Earth**

<http://eol.jsc.nasa.gov>

This Web site hosts the best and most complete online collection of astronaut photographs of the Earth, including over 480,000 photos from Space Shuttle and the International Space Station. Users can search the database of photos by geographic coordinates or region, mission, features, cloud cover and many other options. The site also features an image of the week, as well as special collections of images, including: Cities, Earth Landscape, Earth-Human Interaction, Distinctive Features, Hurricanes and Weather, Earth's Water Habitat, and Geographical Regions.

**United States of America Digital Landsat Mosaics: a 4-CD set of Landsat satellite imagery of the fifty states**

<http://catalog.core.nasa.gov/core.nsf/item/400.1-52>

Using the US Digital Landsat Mosaics we can increase our understanding of Earth system science and the effects humans have on the global environment. The mosaics were developed primarily from data collected by the Landsat 4 and Landsat 5 satellites as they orbited the Earth ten or more years ago. This historical imagery is a valuable record of the conditions on Earth around the year 1990. The CD was developed by NASA Stennis Space Center and the US Geological Survey. It also includes a basic Landsat tutorial. **Recommended for: high school–adult.**

**Visible Earth**

<http://visibleearth.nasa.gov>

This companion site to the NASA *Earth Observatory* (<http://earthobservatory.nasa.gov>) is a comprehensive image gallery for access to NASA Earth science images, animations, and data visualizations. Most resources are available digitally at multiple resolutions, with captions and metadata.

**Recommended for: media and general public.**

**Where on Earth...?" MISR Mystery Image Quizzes**

<http://www-misr.jpl.nasa.gov/education/whereonearth.html>

Embark on a geographical adventure with NASA's Multi-angle Imaging SpectroRadiometer (MISR) Mystery Image Quizzes. These puzzles are designed to inspire understanding of the physical, biological and human processes that influence our home planet and cover topics from Archaeology to Zoology. Several resources for discovering and revealing the meaning of image features may help new geographical detectives to solve the challenging quiz questions. A new "Where on Earth...?" mystery quiz appears as the MISR "latest featured image" approximately once every two months.

Answers are published on the MISR web site (<http://www-misr.jpl.nasa.gov>). The names and home towns of respondents who answer all questions correctly by the deadline will also be published in the order responses were received. The first three people on this list who are not affiliated with NASA, JPL or MISR and who have not previously won a prize will be sent a print of the image.

**Recommended for: informal education.**

## Background Resources for Informal Educators

### ■ BROCHURES/GUIDES

**Aqua Brochure**

[http://eosps0.gsfc.nasa.gov/ftp\\_docs/Aqua\\_brochure.pdf](http://eosps0.gsfc.nasa.gov/ftp_docs/Aqua_brochure.pdf)

"Aqua," Latin for "water," is a NASA Earth Science satellite mission named for the large amount of information that the mission will be collecting about the Earth's water cycle, including evaporation from the oceans, water vapor in the atmosphere, clouds, precipitation, soil moisture, sea ice, land ice and snow cover on the land and ice. Additional variables also being measured by Aqua include radiative energy fluxes, aerosols, vegetation cover on the land, phytoplankton and dissolved organic matter in the oceans and air, land and water temperatures. This brochure provides a comprehensive overview of the Aqua spacecraft, instruments, science and data products.

**Recommended for: post secondary and resource for informal educators.**

**Climate Change Presentation Kit, 1999**

<http://www.epa.gov/enviroed/globalclimate.html>

The Climate Change Presentation Kit is offered as a resource to help prepare talks for students or the general public. The toolkit allows teachers the option of picking and choosing the components that they would need to communicate climate change issues to audiences. It contains fact sheets, a PowerPoint slide presentation and interactive activities that are designed to interest audiences of all levels. Order this free CD-ROM at the Web site provided. **Recommended for: elementary–college educators, informal educators.**

**GRACE Brochure**

[http://eosps0.gsfc.nasa.gov/ftp\\_docs/GRACE.pdf](http://eosps0.gsfc.nasa.gov/ftp_docs/GRACE.pdf)

Gravity controls everything from the motion of the ocean tides to the expansion of the entire Universe. To learn more about the mysteries of gravity, twin NASA satellites named GRACE, short for the Gravity Recovery and Climate Experiment, are being launched to make detailed measurements of Earth's gravity field. This experiment could lead to discoveries about gravity and Earth's natural systems, which could have substantial benefits for society and the world's population.

**Recommended for: post secondary and resource for informal educators.**

**ICESat: Ice, Cloud, and land Elevation Satellite**

[http://icesat.gsfc.nasa.gov/ICESat\\_Brochure.pdf](http://icesat.gsfc.nasa.gov/ICESat_Brochure.pdf)

The mission brochure for NASA's ICESat, which was launched January 12, 2003. ICESat is the benchmark Earth Observing System mission for measuring ice sheet mass balance, cloud and aerosol heights, as well as land topography and vegetation characteristics.

**Recommended for: college/university instructors and students; informal educators.**

**MODIS Brochure**

[http://eosps0.gsfc.nasa.gov/ftp\\_docs/MODIS.pdf](http://eosps0.gsfc.nasa.gov/ftp_docs/MODIS.pdf)

The first NASA Earth Observing System (EOS) satellite, called Terra, was launched on December 18, 1999, carrying five remote sensors. The most comprehensive EOS sensor is MODIS, the Moderate Resolution Imaging Spectroradiometer. MODIS offers a unique combination of features: it detects a wide spectral range of electromagnetic energy; it takes measurements at three spatial resolutions (levels of detail); it takes measurements all day, every day; and it has a wide field of view. This continual, comprehensive coverage allows MODIS to complete an electromagnetic picture of the globe every two days.

**Recommended for: post secondary and background resource for informal educators.**



## ■ MEDIA/WRITER'S GUIDES

### NASA's Earth Observing System—Global Change Media Directory 2001

[http://eospsso.gsfc.nasa.gov/ftp\\_docs/2001\\_media\\_directory.pdf](http://eospsso.gsfc.nasa.gov/ftp_docs/2001_media_directory.pdf)

This publication contains an alphabetical list of NASA Earth Observing System researchers, with contact information and their areas of expertise. It also contains indices for areas of expertise and location, as well as media resources and public affairs contacts. An online version of the directory is titled *Global Change Experts Directory* and is available at: <http://dough.gsfc.nasa.gov:591/eobsearch.html>.

**Recommended for:** broadcast and print media.

### Science Writers' Guide to Aqua

[http://eospsso.gsfc.nasa.gov/ftp\\_docs/Aqua\\_Sci\\_Writer's\\_Guide.pdf](http://eospsso.gsfc.nasa.gov/ftp_docs/Aqua_Sci_Writer's_Guide.pdf)

The *Science Writers Guide to Aqua* provides a comprehensive overview of the Aqua mission, instruments, research, science teams and public affairs contacts. All information is provided to aid the professional science writer in writing stories and articles related to the Aqua mission. **Recommended for:** science writers/media.

### Science Writers Guide to Landsat-7

[http://eospsso.gsfc.nasa.gov/ftp\\_docs/Landsat7\\_writer\\_guide.pdf](http://eospsso.gsfc.nasa.gov/ftp_docs/Landsat7_writer_guide.pdf)

Landsat 7 is advancing several areas of Earth science, including monitoring croplands and mapping Antarctic ice streams. This guide profiles several Landsat 7 research projects, and provides background and contact information. **Recommended for:** science writers/media.

### Science Writers Guide to Terra

[http://eospsso.gsfc.nasa.gov/ftp\\_docs/Terra\\_Writers\\_Guide.pdf](http://eospsso.gsfc.nasa.gov/ftp_docs/Terra_Writers_Guide.pdf)

The launch of NASA's Terra spacecraft marked a new era of comprehensive monitoring of the Earth's atmosphere, oceans and continents from a single space-based platform. Data from the 5 Terra instruments are creating continuous, long-term records of the state of the land, oceans and atmosphere. Together with data from other satellite systems launched by NASA and other countries, Terra will inaugurate a new self-consistent data record that will be gathered over the next 15 years. This guide provides research profiles, as well as extensive background and contact information for Terra.

**Recommended for:** science writers/media.

## ■ WEB SITES

### EOS Project Science Office

<http://eospsso.gsfc.nasa.gov/>

The Earth Observing System (EOS) is the centerpiece of NASA's ESE. It is composed of a series of satellites, a science component and a data system supporting a coordinated series of satellites—for long-term global observations of the land surface, biosphere, solid Earth, atmosphere and oceans. The EOS Project Science Office is committed to bringing program information and resources to program scientists and the general public alike. Visit the project's Web site to find resources for educators, including educational links and publications from the EOS program. **Recommended for:** elementary—secondary educators, undergraduate—graduate.

### NASA Earth Science Missions—Education Programs and Resources

Many of NASA's Earth science missions have an education and/or public outreach component. These efforts include a wide variety of activities and resources for educators, students and the public, including teacher workshops, public programs and events, and curriculum and classroom materials. Visit the Web sites listed with each mission for specific information on a mission's programs and resources, including access to satellite imagery and other data. Missions are listed by year of launch or scheduled launch.

#### TOPEX/Poseidon

<http://sealevel.jpl.nasa.gov/education/education.html>

Jointly sponsored by NASA and CNES, the French space agency, the TOPEX/Poseidon satellite uses radar altimeters to continuously survey ocean surface height. The Jason-1 satellite joined TOPEX/Poseidon in orbit in 2001 to collect similar data.

Scientists are using TOPEX/Poseidon and Jason-1 data to learn more about global ocean circulation patterns, including phenomena such as El Niño/La Niña. Oceans are a key mechanism in transporting heat from the Sun around the globe. Researchers are working to improve understanding of the role oceans play in controlling seasonal variations and longer-term climate changes. Ocean altimetry data are also used for operational purposes, including ship routing, fisheries management, hurricane forecasting and support of underwater activities like cable laying. **CONTACT:** Annie Richardson or Mona Jasnow, Jet Propulsion Laboratory, **Email:** [topex@jpl.nasa.gov](mailto:topex@jpl.nasa.gov). (Launched: 1992)

**SeaWiFS**

<http://seawifs.gsfc.nasa.gov/SEAWIFS/TEACHERS>

The Sea-viewing Wide Field-of-view Sensor (SeaWiFS) is providing quantitative data on global ocean bio-optical properties. Subtle changes in ocean color signify various types and quantities of marine phytoplankton (microscopic marine plants), the knowledge of which has both scientific and practical applications. SeaWiFS has helped us to not only monitor the short-term spatial and temporal variability in the ocean's biology, but also to have the first well-calibrated, long-term data set that allows us to quantify the ocean's biological response to global change. (Launched: 1997)

**Tropical Rainfall Measuring Mission (TRMM)**

<http://trmm.gsfc.nasa.gov>

<http://strategies.org/TRMM.html>

TRMM is a joint mission between NASA and the National Space Development Agency of Japan (NASDA). It is designed to monitor and study tropical rainfall and the associated release of energy that helps to power the global atmospheric circulations shaping both weather and climate around the world.

**CONTACT:** Jeffrey Halverson, TRMM Education and Outreach Scientist, Code 912, NASA Goddard Space Flight Center, Greenbelt, MD 20771, **Phone:** 301-614-6333, **Email:** halverson@agnes.gsfc.nasa.gov. (1997 launch)

**ACRIMSAT**

<http://acrim.jpl.nasa.gov/education/eduindex.html>

Using the Active Cavity Radiometer Irradiance Monitor (ACRIM) III instrument, the ACRIMSAT spacecraft provides long-term, precise measurements of the total amount of the Sun's energy that falls on our planet's surface, oceans and atmosphere. ACRIM I was the first instrument to clearly show that the energy from the Sun is not a constant value but instead varies over time. These energy changes are small but significant, and they cycle approximately every 11 years. ACRIMSAT data is vital to helping scientists build more accurate climate models. (Launched: 1999)

**Landsat 7**

<http://landsat.gsfc.nasa.gov/main/education.html>

The Landsat 7 satellite is acquiring remotely-sensed images of land surface and coastal regions for global change research, regional environmental change studies, national security uses and other civil and commercial purposes. The Landsat 7 data set will provide the first high-resolution view of both seasonal and interannual changes in the terrestrial environment.

**CONTACT:** Stephanie Stockman, Code 921, NASA Goddard Space Flight Center, **Phone:** 301-614-6457, **Email:** stockman@core2.gsfc.nasa.gov. (Launched: 1999)

**SeaWinds on QuikSCAT**

<http://winds.jpl.nasa.gov/education>

The SeaWinds instrument on the QuikSCAT satellite is a "quick recovery" effort to fill the gap created by the loss of data from the NASA Scatterometer (NSCAT) when the satellite lost power in June of 1997.

SeaWinds is a specialized microwave radar that measures near-surface wind speed and direction over the Earth's oceans under all weather and cloud conditions.

**CONTACT:** Peter Falcon, Scatterometer Projects Outreach Coordinator, Jet Propulsion Laboratory, 4800 Oak Grove Dr., MS TR 1722-114, Pasadena, CA 91109-8099, **Phone:** 818-393-0729, **Fax:** 818-354-8813, **Email:** pcfalcon@pop.jpl.nasa.gov. (Launched: 1999)

**Terra**

<http://terra.nasa.gov>

Terra, the flagship satellite of NASA's Earth Observing System, is collecting what will ultimately become a new, 15-year global data set on the state of the land, oceans and atmosphere. Data from this mission are used in many research and commercial applications. **CONTACT:** David Herring, Code 913, NASA Goddard Space Flight Center, Greenbelt, MD 20771, **Phone:** 301-614-6219, **Email:** dherring@climate.gsfc.nasa.gov. (Launched: 1999)

**EO-1**

<http://eo1.gsfc.nasa.gov/Education/eo1Education.html>

Earth Observing-1 (EO-1) is the first flight of NASA's New Millennium Program (NMP). Its mission is to validate technologies that will reduce the cost and increase capabilities of upcoming land-imaging missions. As a result of EO-1, future spacecraft will be an order of magnitude smaller and lighter than current versions. **CONTACT:** Joseph Young, EO-1 Mission Technology Transfer Manager, NASA Goddard Space Flight Center, **Phone:** 301-286-8146, **Email:** joseph.p.young.1@gsfc.nasa.gov. (Launched: 2000)

**Jason-1**

<http://sealevel.jpl.nasa.gov/education/education.html>

Jointly sponsored by NASA and CNES, the French space agency, Jason-1 is a follow-on mission to TOPEX/Poseidon. See TOPEX/Poseidon (1992 launch) listing on p. 33 for additional details. (Launched: 2001)

**SAGE III/METEOR-3M**

<http://www-sage3.larc.nasa.gov>

The Stratospheric Aerosol and Gas Experiment (SAGE) III mission on the Russian Meteor-3M spacecraft seeks to enhance our understanding of natural and human-derived atmospheric processes by providing high-latitude, long-term measurements of the vertical structure of aerosols, ozone, water vapor and other important trace gases in the upper troposphere and stratosphere. **CONTACT:** David Woods, NASA Langley Research Center, Hampton, VA 23681, **Email:** d.c.woods@larc.nasa.gov. (Launched: 2001)

**Aqua**

<http://aqua.nasa.gov>

Latin for "water," Aqua is named for the large amount of information the mission is collecting about the Earth's water cycle, including evaporation from the oceans, water vapor in the atmosphere, clouds, precipitation, soil moisture, sea ice, land ice and snow cover on land and ice. Additional variables also being measured by Aqua include radiative energy fluxes, aerosols, vegetation cover on land, phytoplankton and dissolved organic matter in the oceans and air, land and water temperatures. **CONTACTS:** Claire Parkinson, Code 971, NASA Goddard Space Flight Center, Greenbelt, MD 20771, **Phone:** 301-614-5715, **Email:** claire.l.parkinson@nasa.gov; Steve Graham, Code 900, NASA Goddard Space Flight Center, **Phone:** 301-614-5561, **Email:** steven.m.graham.2@gsfc.nasa.gov. (Launched: 2002)

**GRACE**

<http://www.csr.utexas.edu/grace/education>

The second of the Pathfinder missions, the Gravity Recovery and Climate Experiment (GRACE) employs a satellite-to-satellite microwave tracking system to measure the Earth's gravity field and its variability over time. Such measurements are directly coupled to long-wavelength ocean circulation processes and to the transport of ocean heat to the Earth's poles. **CONTACT:** **Email:** grace\_edu@tsgc.utexas.edu. (Launched: 2002)

**SeaWinds on ADEOS II**

<http://winds.jpl.nasa.gov/education>

The Advanced Earth Observing Satellite (ADEOS) II is a joint mission with the National Space Development Agency of Japan (NASDA). The SeaWinds scatterometer is a specialized microwave radar that measures near-surface wind velocity (both speed and direction) over the Earth's oceans under all weather and cloud conditions. **CONTACT:** Peter Falcon, Scatterometer Projects Outreach Coordinator, Jet

Propulsion Laboratory, 4800 Oak Grove Dr., MS TR 1722-114, Pasadena, CA 91109-8099, **Phone:** 818-393-0729, **Fax:** 818-354-8813, **Email:** pcfalcon@pop.jpl.nasa.gov. (Launched: 2002)

**ICESat**

<http://icesat.gsfc.nasa.gov/publicoutreach.html>

The Ice, Cloud and Land Elevation Satellite (ICESat) operates the Geoscience Laser Altimeter System (GLAS). GLAS is accurately measuring the elevation of the Earth's ice sheets, clouds and land. Data is available from the National Snow and Ice Data Center (<http://nsidc.org/daac/icesat>). **CONTACT:** **Email:** webmaster@icesat0.gsfc.nasa.gov. (Launched: 2003)

**SORCE**

[http://lasp.colorado.edu/sorce/edu\\_outreach.html](http://lasp.colorado.edu/sorce/edu_outreach.html)

The Solar Radiation and Climate Experiment (SORCE) mission is providing state-of-the-art measurements of incoming x-ray, ultraviolet, visible, near-infrared and total solar radiation. The measurements provided by SORCE specifically address long-term climate change, natural variability and enhanced climate prediction, as well as atmospheric ozone and UV-B radiation. These measurements are critical to studies of the Sun and its effect on the Earth system. **CONTACT:** Gary Rottman, Laboratory for Atmospheric and Space Physics, Campus Box 590, University of Colorado, Boulder, CO 80309-0590, **Phone:** 303-492-8324, **Email:** gary.rottman@lasp.colorado.edu. (Launched: 2003)

**Aura**

<http://aura.gsfc.nasa.gov/outreach>

Aura will study the Earth's ozone, air quality and climate. The mission is designed exclusively to conduct research on the composition, chemistry and dynamics of the Earth's upper and lower atmosphere. **CONTACT:** Stephanie Stockman, Code 921, NASA Goddard Space Flight Center, **Email:** stockman@core2.gsfc.nasa.gov. (Scheduled launch: 2004)

**GIFTS**

<http://tellus.ssec.wisc.edu/outreach/gifts/gifts.htm>

The Geosynchronous Imaging Fourier Transform Spectrometer (GIFTS) will make revolutionary advances in weather observations and potentially improve weather forecasts by making vertical and horizontal measurements of winds, water vapor and temperature in the Earth's atmosphere from a geosynchronous orbit. **CONTACT:** Arlene Levine, NASA Langley Research Center, Hampton, VA 23681-0001, **Phone:** 757-864-3318, **Email:** a.s.levine@larc.nasa.gov. (Scheduled launch: 2005)

**CALIPSO**

<http://www-calipso.larc.nasa.gov/outreach>

The Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO) satellite will produce the first global three-dimensional view of aerosols and clouds. It will improve our understanding of the role aerosols and clouds play in the processes that govern climate responses and feedbacks, and improve the representation of aerosols and clouds in models, leading to more accurate predictions of climate change.

Accurate climate model predictions will provide international and national leaders with reliable information to make more informed policy decisions about global climate change. CALIPSO will fly in formation with Cloudsat (see next listing) and other satellites.

**CONTACTS:** Dianne Robinson, Outreach Director for CALIPSO, Interdisciplinary Science Center (ISC), Hampton University, **Email:** [dianne.robinson@hamptonu.edu](mailto:dianne.robinson@hamptonu.edu); Barbara Maggi, Assistant Outreach Director for CALIPSO, Center for Atmospheric Sciences (CAS), Hampton University, **Email:** [barbara.maggi@hamptonu.edu](mailto:barbara.maggi@hamptonu.edu). (Scheduled launch: 2005)

**CloudSat**

<http://cloudsat.atmos.colostate.edu/outreach>

CloudSat will provide vertical profiling from space of the full range of clouds, from thin cirrus to thick, precipitating convective clouds. It will also provide the first quantitative estimates of ice in clouds. The mission will fill a critical gap in the investigation of feedback mechanisms linking clouds to climate. CloudSat will orbit in formation as part of a constellation of satellites including Aqua, Aura and CALIPSO. One of the unique features that CloudSat brings to this constellation is the ability to fly a precise orbit, enabling the footprint of the CloudSat radar to be overlapped with that of the CALIPSO lidar, as well as with other instruments in the constellation. The precision of this overlap creates a unique multi-satellite observing system for studying atmospheric processes essential to the hydrological cycle. **CONTACT:** Debra Krumm, Outreach Coordinator, Department of Atmospheric Science, Colorado State University, Fort Collins, CO 80523-1371, **Phone:** 970-491-8790, **Email:** [dkrumm@atmos.colostate.edu](mailto:dkrumm@atmos.colostate.edu). (Scheduled launch: 2005.)